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17 min read

82. Is it possible to rebuild Saturn 5 and fly to the moon?

I think that not only me, but you have come across this article - why it is impossible to use old drawings and build the "legendary" Saturn-5 "of incredible carrying capacity (According to the NASA legend, it was" Saturn-5 "that sent Apollo with people to the Moon). The article was written several years ago, and since then, foreign agents under various names of "authors" publish it in our Russian-speaking sector of the Internet. You can also find it here, on the Yandex channel. Here is a small quote fromsuch an article .

> Now that NASA is returning to the idea of lunar expeditions, many are wondering: why re-develop super-heavy launch vehicles? There are ready-made drawings! Let's rebuild Saturn 5!

> Let's say we got the blueprints for the rocket, knocked funding out of Congress, and decided to restore production of the Saturn 5. We begin to deal with the drawings in order to decide what parts and where to order. And ... we immediately run into a problem.

And then there is a detailed description of why it is impossible to repeat "Saturn-5".

The first impression at the beginning of reading the article - the authors have never worked in production, have no idea what the "Technological Regulations" is, and therefore, facts and phenomena are beginning to replace their fantasies.

For example, - say the authors of the article - some kind of alloy is indicated in the drawings of the parts, but no one knows (I quote from the article) " **how and from what exactly it was made** ." And so these people start looking for documentation, but alas, everything is gone. “ **With great difficulty they manage to find an old retired archivist,** ” but who after years (half a century has already passed) cannot remember in any way in

which desk drawer he put the documentation for this alloy, and at which plant it was in general. Because of this, the old man has to re-invest millions of dollars to re-develop this alloy.

When I read the sentimental story about an old man who forgot where he put the folder with the documents, and thereby took the secret of alloy making with him to the grave, tears came to my eyes.

I immediately remembered the touching story set out in the ballad by Robert Louis Stevenson "Heather honey "translated by S. Marshak.

From the heather, the drink
Forgotten a long time ago.
And he was sweeter than honey,
Drunker than wine ...

In the ballad, the old man did not want to give the Scottish king the secret of making heather honey and took the secret with him to the grave.

Likewise, old retirees who once worked for NASA left the factory and took the secret with them. Well, just like the medieval masters.

Further, in the article about the attempt to restore the documentation for "Saturn-5", we meet even more sentimental scenes. For example, in a drawing, a part of a complex shape. But nowhere is it explained why the engineer chose such a complex design. Moreover. "The **engineer who once made that decision has left and we cannot ask him. His personal work file was lost in transit.** "

When I read the phrase " **His personal work file was lost,** " I realized that Google translator had failed to cope with the text and failed to adapt the phrase about "personal work file" into Russian, and the author of the article did not dare to change the text approved by the curator of the State Department ... However, I wonder what kind of "personal work files" were NASA engineers in 1969? And why didn't they figure out how to send working files to cloud storage before "transporting"?

In general, the defenders of NASA describe the situation with "Saturn-5" as in the famous comedy: "Chief, everything is gone! The plaster cast is being removed, the client is

leaving."

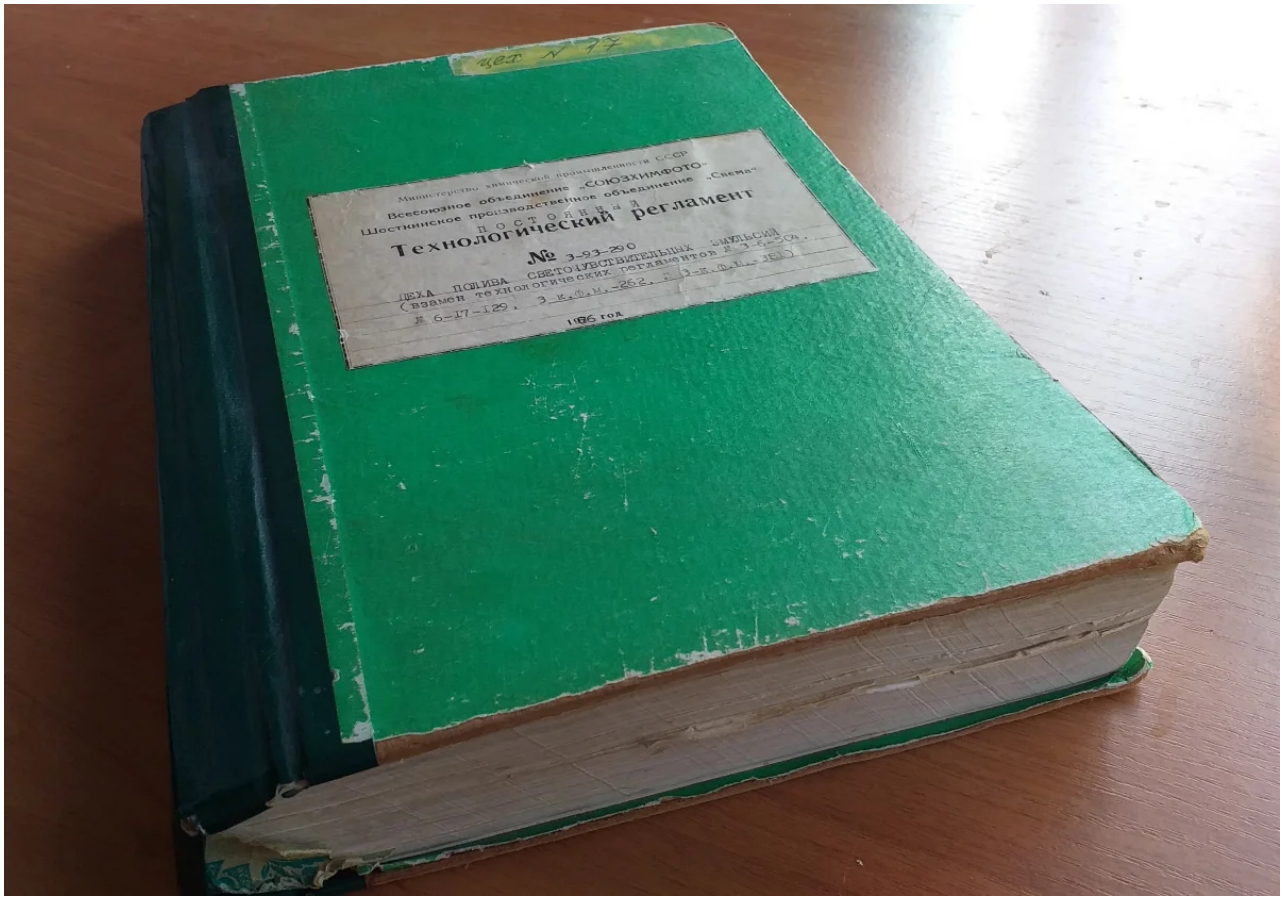
Even from ordinary bolts, the authors of the article managed to build a problem out of the blue: "the **bolts that were used on the Saturn-5 to fasten the fuel components supply pipes are now made using a different technology, from a different material** ."

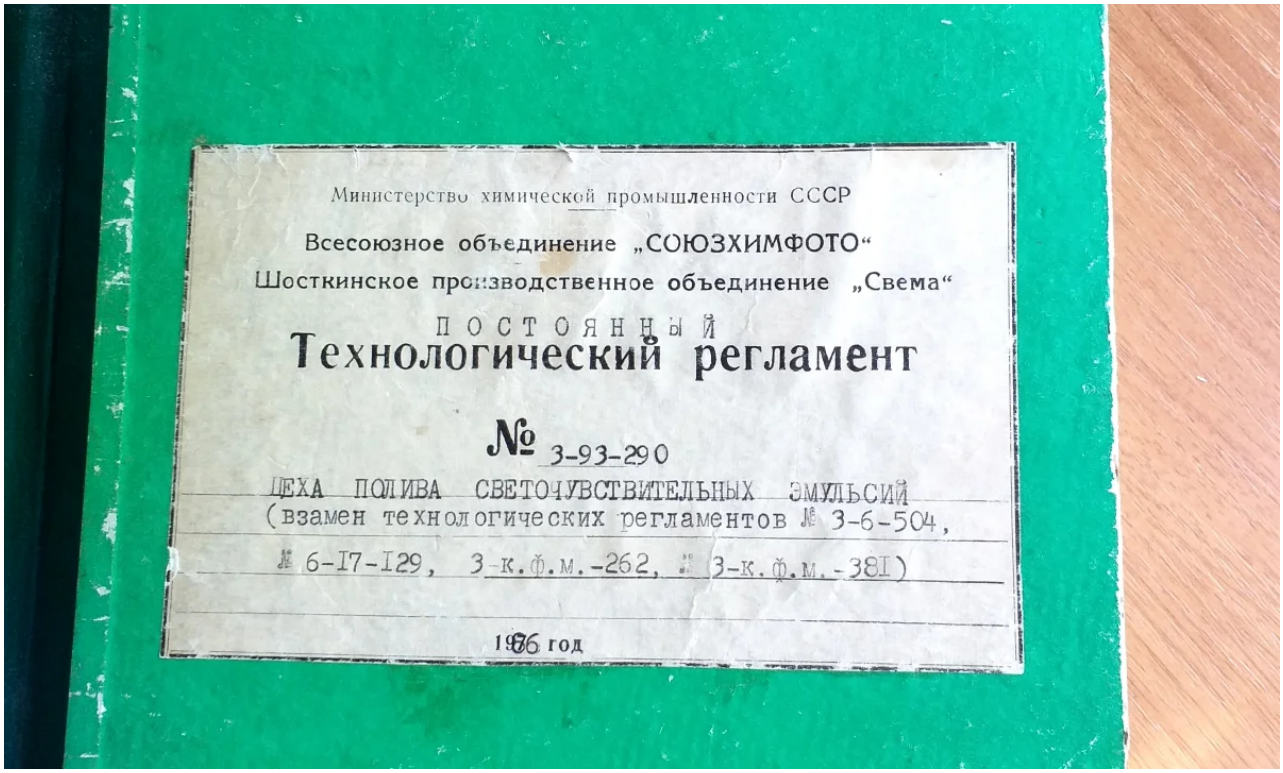
In short, wherever you throw it, there is a wedge everywhere. Hence the conclusion: you have to start everything from scratch, reinvent bolts and screwdrivers. And even well-proven lunar spacesuits will have to be sewn again - all that remains is to find someone who could do it.

I have a very superficial understanding of rocket technology, but I have a good idea of how film is made. And so let's imagine that we suddenly came up with the idea to revive the Soviet film. Can we do it? 30 years have passed since the collapse of the Soviet Union, the last "Soviet" films were developed in the 70-80s. XX century. Will we be able to find those "oldies" who remember how films were made 40-50 years ago?

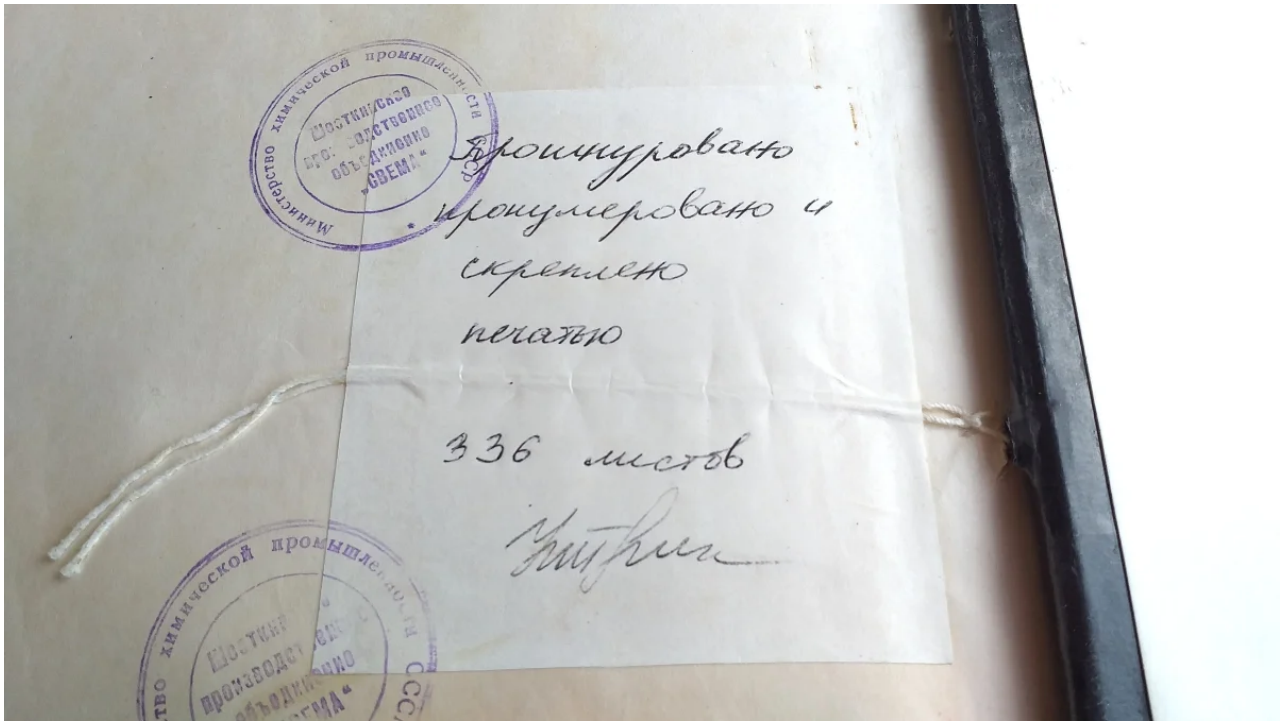
It turns out that tormenting the "oldies" with memories - how was it? - you won't have to. All stages of film production are spelled out in the "Technological Regulations".

This is how it looks:



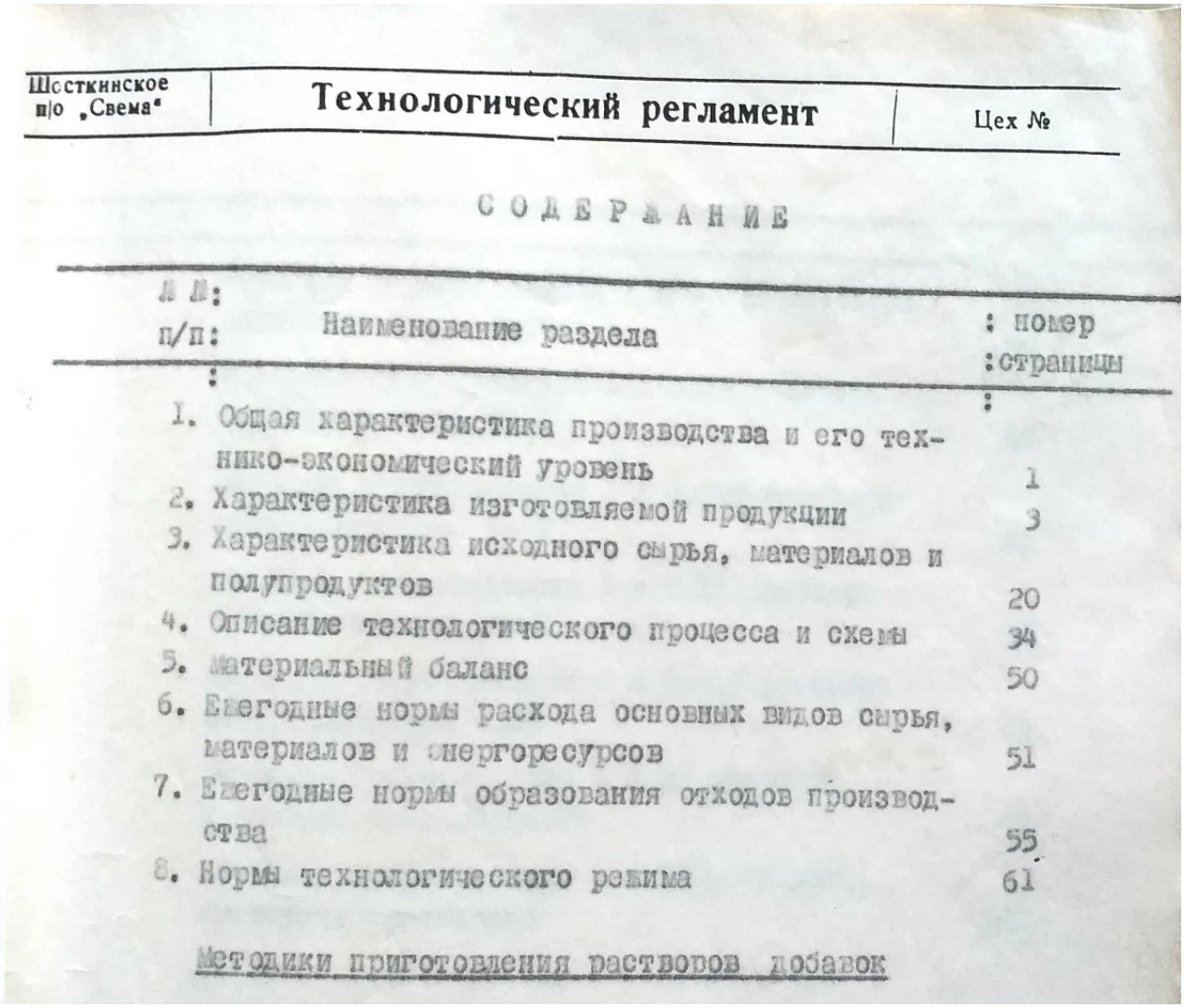


On the last page there is an entry: "336 sheets laced, numbered and sealed with a seal."



The Technological Regulations describe the production of 16 types of various films, ranging from radiographic (X-ray) medical and dosimetric films to black-and-white and color films for film photography - negative, phonogram (for sound recording), reversible and countertype (these are films for making duplicates of negatives for replication).

And the Technological Regulations begin with this: first, there is a general characteristic of production, then a characteristic of manufactured products and a characteristic of raw materials. The following is a description of the technological process and the annual consumption rates of raw materials and waste generation rates.



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СОДЕРЖАНИЕ

In a separate table, it is indicated on which machine the emulsion is irrigated, the year of manufacture of this machine and who is the general designer of the machines (indicated - Giprokino polygraph).

In the characteristics of the products, it is specified on what basis the film photographic material is made - on colorless or dyed in bulk. So, X-ray materials are made on a thick blue base, and reversible films are made on a transparent base.

The X-ray film has a blue colored base.

The X-ray film has a blue colored base.

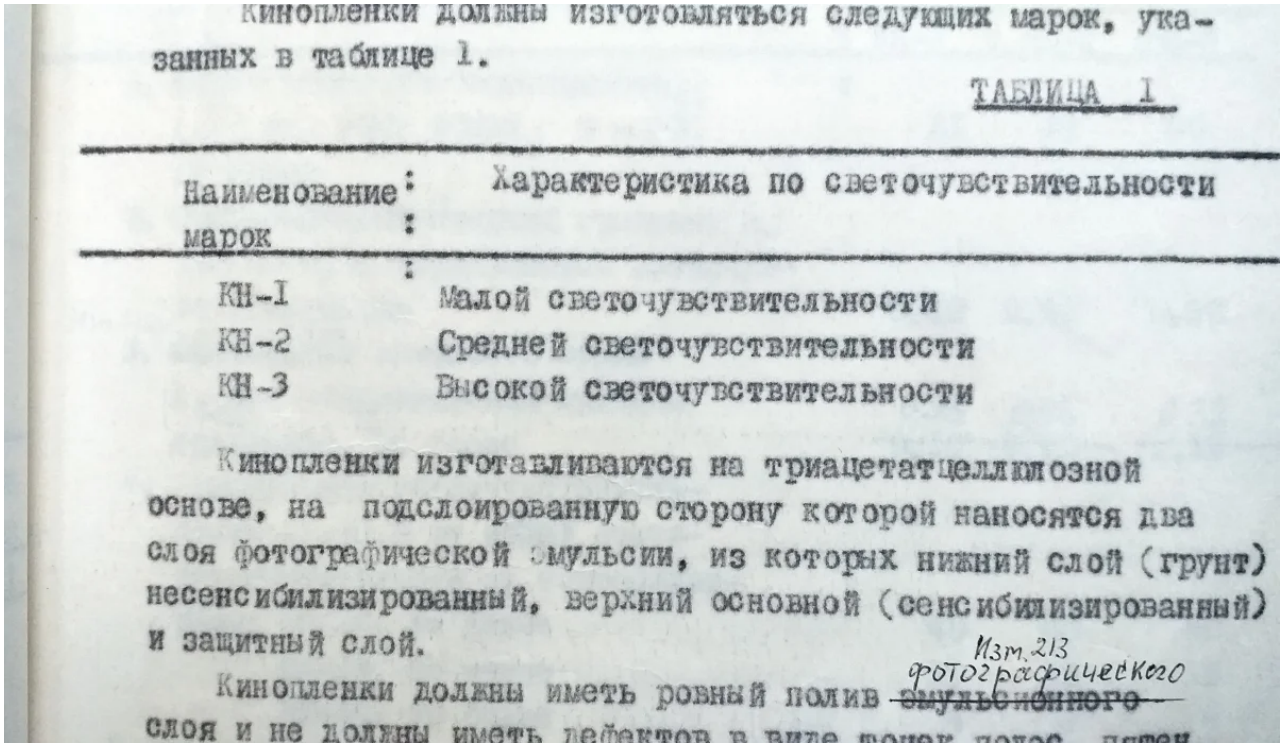
The width of the spill (1120 mm), the length of the base in a roll, the deposition of metallic silver per 1 square meter and the resulting photosensitivity and contrast are indicated.

The actual width of the film before cutting is 112 cm.

The actual width of the film before cutting is 112 cm.

This is followed by the methods for the preparation of ALL solutions that are used in the manufacture and processing of film: methods for the preparation of stabilizers, sensitizers, components, wetting agents, tanning agents, methods for the preparation of solutions of potassium bromide, caustic soda, nitric acid, sodium carbonate, triethanolamine, emulsifiers, indicators and buffer solutions ...

All tapes referred to in the Regulations are named. At film studios in the Soviet Union, black-and-white negative films of the type KN (film-negative) were used, there were three of them, of different sensitivity. The emulsion consisted of two light-sensitive layers: the lower layer was called "soil", it was of low sensitivity, and a basic, highly sensitive layer was applied on top.



Кинопленки должны изготовляться следующих марок, указанных в таблице 1.

ТАБЛИЦА 1

Наименование марок	Характеристика по светочувствительности
КН-1	Малой светочувствительности
КН-2	Средней светочувствительности
КН-3	Высокой светочувствительности

Кинопленки изготавливаются на триацетатцеллюлозной основе, на подслоированную сторону которой наносятся два слоя фотографической эмульсии, из которых нижний слой (грунт) несенсибилизированный, верхний основной (сенсибилизированный) и защитный слой.

Изм. 213

Кинопленки должны иметь ровный полив ~~эмульсионного~~ фотографического слоя и не должны иметь дефектов в виде точек, пятен

For each type of film, light sensitivity, contrast ratio, veil and other characteristics are indicated.

For each type of raw material, a State or industry standard, technical conditions, regulations or preparation method is indicated. For example "Stabilizer F-2" must comply with TU 6-14-785-77, and "Tanner DU-679" - TU 6-17-667-75. Glycerin must be "h" (pure) or "analytical grade" (pure for analysis) and comply with GOST 6259-75. Even the gauze

that is used at the factory should not be just gauze bought in a store or on the market, but comply with GOST 9412-77 "Medical gauze".

Why am I dwelling in such detail on these standards and specifications? Because the same standards exist for every part produced. Here are the defenders of the lunar scam mention in their article that in "Saturn-5" there was a certain " **detail of a complex shape** ." And the authors of this article are trying to convince us that the drawing of this part was stored in a single copy by a NASA engineer in " **personal files**". An old man retired or died from an illness - and that's all - the secret of making a part is forever lost. In fact, for any product, for any part, there is a GOST or OST (industry standard). Each part has a link to the design documentation, according to The engineer lost the drawing - so what? They opened the design documentation, which was used to make the part, looked at the GOST - and made it again.

This is only when lone inventors, so as not to have their invention stolen from them, use certain conventions and symbols in their correspondence that are incomprehensible to an ordinary person. For example, the inventor of photography Joseph Niepce, who was the first in the world to take a photograph on asphalt layers, wrote in letters to Louis Daguerre how he was looking for a substance that could replace asphalt. He replaced all substances in the letter with numbers. I will cite a fragment of one letter dated August 23, 1832, where I will indicate in parentheses what substance was meant by this or that symbol.

> "All the time I have been working on 1 (lavender essence) and have found a great variety in this substance. It can often do without an admixture of 2 (refined oil), since we added 2, not 60 (oil) ... I did not find still such an essence that would give a good matte surface. 46 (light), and yet there is no mixture with 2 (refined oil). "

Now everything is clearly spelled out in the documentation. Even a banal box of matches has its own GOST, which indicates the size of the box in all dimensions, the thickness of the matches, and the chemical composition of the sulfur head.

Matches are made according to GOST 1820-77

Matches are made according to GOST 1820-77

And the Americans cannot make a single step without these standards and technical conditions. For example, to simply open a hatch door in a module, they first open the RTM (guiding technical material) and read point by point what and in what sequence must be done to open it. Watch any space movie - Americans can't live without instructions. Something happened - and they open a thick book of technical documentation, find the right item and read what they need to do in this case.

When it is necessary to make a mechanism in which there are several parts, then a technological procedure is drawn up, where the entire technological process of assembly is described in detail.

For example, at a cinema factory, before applying a light-sensitive emulsion to a base, it, this emulsion, must be prepared for watering. It does not lie next to the irrigation machine, it is stored in another room, in the synthesis workshop, in the form of lumps as hard as jellied meat, and it must first be transported from one building to another and put into a

fluid state. We open the item of the technological regulations called "Preparing the emulsion for watering" and read:

> "Emulsion from the synthesis shop in stainless steel trolleys goes to the storage chambers of the irrigation department. The storage chamber is constantly kept at an air temperature of up to 12 °.
>
> In the storage room, the dosage (weighed in) of the emulsion is made in accordance with the accompanying watering card. Melting of the emulsion is carried out in stainless steel melting apparatus with heated jackets. Stirring of the contents in the apparatus is carried out by a frame-type mixer powered by an electric drive.
>
> ... The total weight of the melt ranges from 100 to 500 kg. "

Then, on three sheets, there follows a description of how the tank is heated with hot water and steam, how the automatic thermostat is turned on, how the emulsion is loaded, how additives are added, how long it is stirred and how the resulting composition is filtered.

The next few sheets are a description of the process of pouring the emulsion onto the base. The description begins with the construction of the irrigation machine.

> The emulsion sprinkler is installed on three floors. The unwinding is mounted on the ground floor; the pulling device is on the second floor, and the extrusion irrigation device is in the basement.

Further, in detail (6 pages), the entire path that the base of the film passes is described - from the unwinding through the gluing table and the system of stock loops to the extrusion-irrigation device, then to the roller table (metal cylinders pulling the film), the gelatinization box and, finally, to the dryer. The width of the film roll is 112 cm. The air purification system supplied to the different sections of the machine is described in detail. The liquid emulsion applied to the base first solidifies in the gelation box, cold air is supplied there (to the first floor), and then (already on the third floor) excess moisture is removed from the emulsion - heated purified air is supplied to the dryer. At the end of the path, the rolls are wound.

And, of course, the technological regulations contain a complete diagram of all machine units, from the melting apparatus (where the emulsion is converted into a liquid state) and

ending with drying ovens and coiling.

The annual consumption rates tabulate not only all types of raw materials (base, silver, gelatin, glycerin, wetting agent, all chemicals), but also take into account energy costs (electricity, steam, cold). Also included are moleskin and cambric filters for emulsion and cardboard air filters.

Well, I only commented on the first 60 pages of technological regulations out of 336.

The very light-sensitive emulsion made in the synthesis shop is silver bromide in a gelatin solution, a jelly-like mass. It is only sensitive to blue rays and can be stored (like black and white photographic paper) under red light. In order for the emulsion to become sensitive to green and red rays, sensitizers must be introduced into the emulsion. If the film is colored, then it is necessary to introduce also the components from which the dye will be formed. To prevent the emulsion in the developer from sliding off the base, tanning agents are added to the emulsion, and wetting agents are added, and also nitric acid to obtain the required pH level. In short, depending on the type of photographic film, various **additives** are introduced into the emulsion .

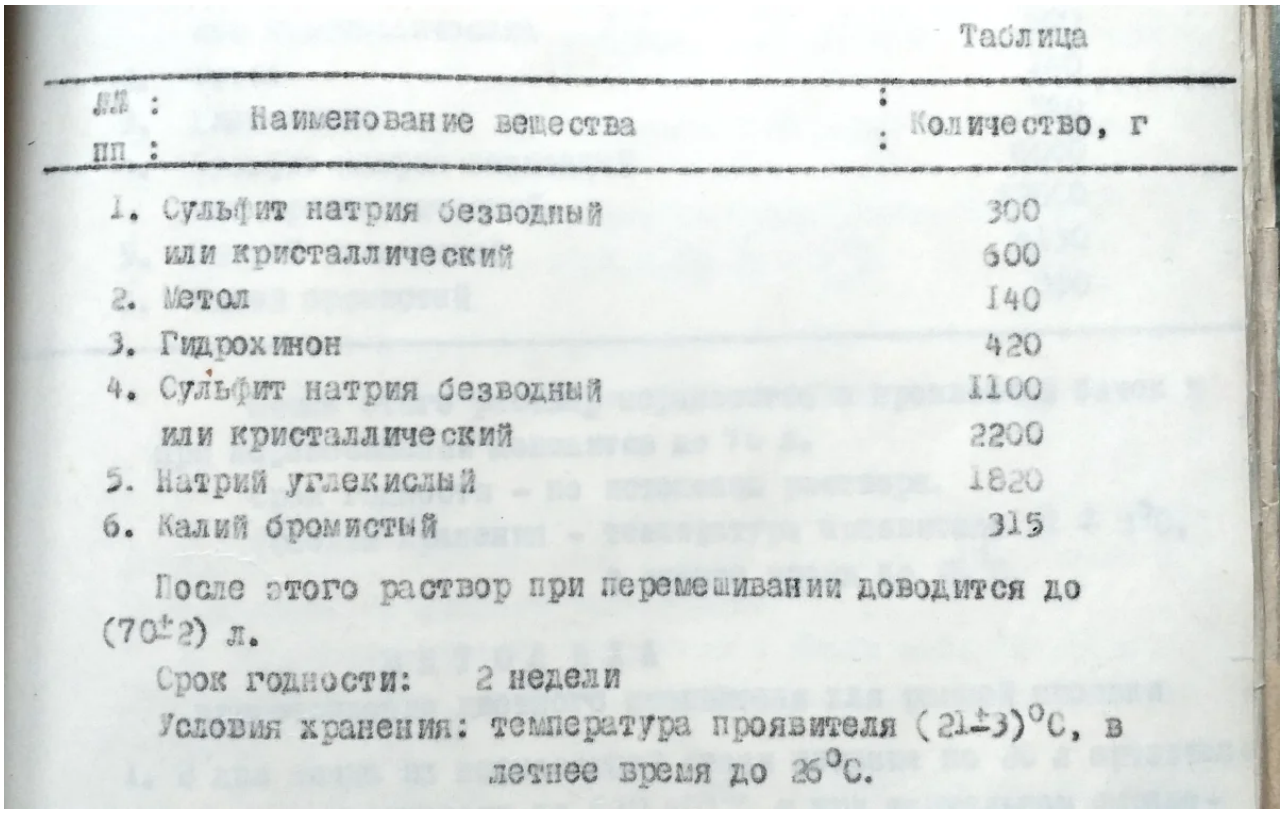
These additives need to be prepared. Therefore, starting from the 61st page of the Technological Regulations, there are methods for preparing additive solutions. For example, a sensitizer is a powder (similar to potassium permanganate), it literally needs a fraction of a gram per 1 kg of emulsion. But it is not poured into the emulsion in the form of a pinch of salt (as we salt soup or cabbage soup), the sensitizer is first dissolved in alcohol, and then this solution is poured into the emulsion with constant stirring. Therefore, the regulation contains the "Method for preparing an alcohol solution of a sensitizer" - which tank you need to take, how much alcohol to pour in, how much to weigh the substances, how to add, how long to stir and at what temperature. And for each substance there is an additive, there are 61 of them - its own preparation method. In total, there are 61 methods for preparing additives in the Technological Regulations.

But the film grade obtained after watering still needs to be checked, tested. And for this you need to prepare processing solutions: developer, fixer, bleach. And this is 6 more methods for different types of films (different developers, different fixers).

Those who at least once directed the developer are well aware of these techniques: heat water to a certain temperature, inject each substance in small portions after the previous

one has completely dissolved. Etc..

The Technological Regulations also contain the formulation of the developer.



Таблица

№№ пп	Наименование вещества	Количество, г
1.	Сульфит натрия безводный	300
	или кристаллический	600
2.	Метол	140
3.	Гидрохинон	420
4.	Сульфит натрия безводный	1100
	или кристаллический	2200
5.	Натрий углекислый	1820
6.	Калий бромистый	315

После этого раствор при перемешивании доводится до (70±2) л.

Срок годности: 2 недели

Условия хранения: температура проявителя (21±3)°С, в летнее время до 26°С.

Black and white developer recipe # 3

Black and white developer recipe # 3

And now we have already gone through 90 pages of the Technological Regulations. This is followed by the methods of preparing the emulsion for watering. A large number of such emulsions are listed. In color film, there are three different light-sensitive layers, in addition there is a filter layer, an anti-halo and a protective layer. All these layers are prepared separately in different tanks, and each layer has its own method of preparation for irrigation.

Tanks for the preparation of various emulsions ("Tasma", Kazan)

Tanks for the preparation of various emulsions ("Tasma", Kazan)

Mechanical agitator in the tank

Mechanical agitator in the tank

The preparation of the emulsion for watering is carried out according to a certain method. First, demineralized water is poured into the melting apparatus (such as a metal cylindrical tank) by turning on a rotating stirrer. Then a weighed portion of the emulsion (in the form of jellied meat) is loaded, a stabilizer is introduced and then melted for 60-90 minutes at a temperature of 40 ° . After that, in accordance withwith an accompanying card , the first additive (for example, a sensitizer solution) is introduced through the funnel and stirred for 10 minutes. Then the second additive is introduced, stirred for 10 minutes. Etc.

After adding all the additives, turn off the mixer and filter through 1 cambric and 2 moleskin napkins, and then through a Cuno filter.

After that, the emulsion is kept in a thermostat (iron tank) for 50 minutes. Moreover, the first 30 minutes - under vacuum - vacuum in the thermostat from 0.4 to 0.7 kg / cm 2. Due

to the vacuum, deaeration occurs - the removal of air bubbles from the emulsion. And only after that the emulsion is ready for watering on the base.

After the emulsion goes through the pipeline to the irrigation machine, the tanks of the melting apparatus and thermostats are washed. This is also reflected in the Technological Regulations: "The **melting apparatus is rinsed after each melt, washed after 6 heats. Thermostats are rinsed with water after each melt, washed after 3 heats** ."

You and I have only reached the middle of the Technological Regulations, and you see that the Technological Regulations reflect all stages of the production of film and photographic materials, and not a single trifle is overlooked.

And exactly the same technological regulations exist in all plants and factories. The entire production is described there step by step. After that, it is so funny to read the naive arguments of NASA's defenders about why it is impossible to recreate Saturn-5. Then their main reason for the impossibility of restoring legendary technologies is that the grandfather from NASA fell ill and took the secret with him to the grave. Then NASA banned the use of some kind of gasket. Readsuch a text and you understand - it's just a combination of naive and primitive. Look here:

> We go even further. The cryogenic systems of the second stage of the rocket use the QB51 seal everywhere. To our great relief, this seal is still in production ... but we can no longer use it. Over the past decades, safety standards have tightened and OSHA (Occupational Safety and Health Administration) has banned the use of the QB51 seal in rocketry.

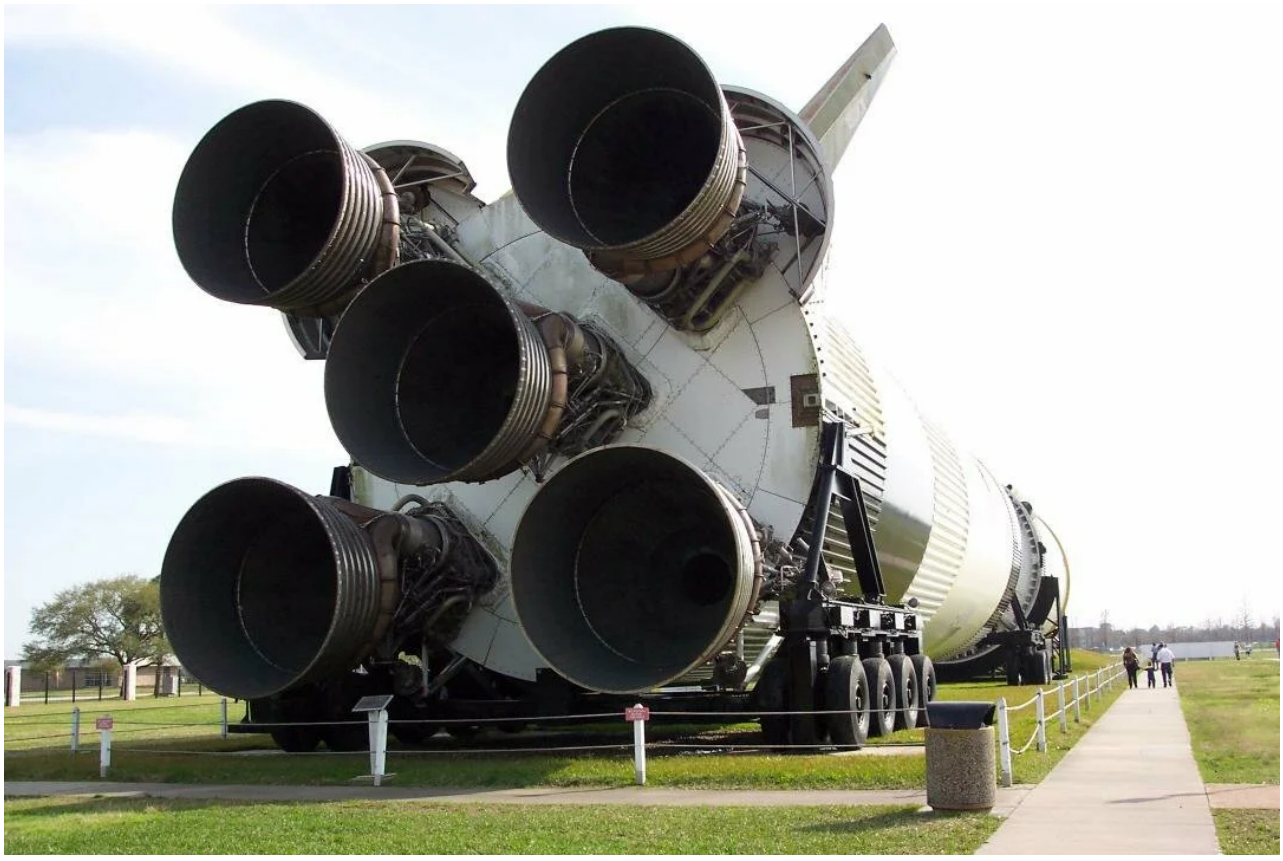
If this spacer is prohibited, put another one. What is the problem? We are constantly faced with similar situations in production. Previously, sodium carbonate of Ukrainian origin was used in the developer, now it is Russian. Previously, the colored developing agent was produced by the city of Dolgoprudny, now - China. Substances differ both in appearance and in reactivity. Previously, Kodak used formalin in stabilizers, and it is very poisonous. I remember 15-20 years ago: you walk through a department store, where there is a developing machine on the 1st floor (you probably remember these points for receiving color films for processing) - and you feel the location of this point by the smell of formalin. Formalin was banned. Kodak switched to a different, less toxic substance. And nobody said

Previously, the engines for our helicopters were made by Ukraine, now they are Russian-made. Replaced and that's it. This is called an upgrade (or modification).

If it is necessary to change something in the technological process, then in production it is elementary simple to get out of the situation. In the name of the Chief Engineer, a memo is written under the title "Changes to the Technological Regulations", they are approved and pinned to the very beginning of the document. And that's all.

And the Regulations themselves are not eternal. It has a certain period of validity, as a rule, 10 years, after which many points of the Regulation are revised and amended.

Therefore, I somehow do not even want to discuss an article written by an amateur who has never worked in production, about why it is impossible to recreate Saturn-5 today. Yes, here he is in the museum, everything is in sight, copy and reproduce.



But the answer to the question - why is it not done? - very simple: if you repeat this "Saturn-5", then it will not fly further than 80 or 100 km from the Earth. And it does not have any 3000-tonne carrying capacity. He could not bring 140 tons to LEO! And the excuses that NASA defenders write in articles on this topic do not stand up to scrutiny.

I immediately recall the words of one editor of a popular science magazine: "All journalists are not competent. The further the topic of the article lies from your work profile, the more literate and convincing the article of the journalist seems to you. And the closer the topic of the article is to the topic that you encounter at work. , the clearer it is for you that the journalist is completely illiterate. "

I believe that the paid trolls of the State Department, having learned that it is possible to lose not only the drawings, but also the Technological Regulations, will definitely write that it is the Technological Regulations that the NASA engineer lost (or forgotten in the closet of the disbanded office). But they do not even understand that this Technological Regulation does not exist in a single copy - someone wrote it, someone brought together all the methods, someone approved it. That a copy of the Regulations is sent to the shop for production, and that the Chief Engineer and the technologist have a duplicate of the Regulations, and not only the head of the shop who produces this or that part.

*

Cameraman L. Konovalov was with you. Until next time!

This is at "Slavich", in the workshop where photographic plates and films are produced. Left - Berezkina Yulia, head of the Mikron plant.

This is at "Slavich", in the workshop where photographic plates and films are produced. Left - Berezkina Yulia, head of the Mikron plant.

PS I have briefly described the content of only the first half of the Technological Regulations. If you are interested, I will tell you what is discussed in the second half of the Regulations.